

Section 8 West Kapālama Geographic Zone (T-048 through T-053)

8.1 Overall Location

For reporting purposes for this AIS, the City Center Section 4 of the HHCTCP has been divided into 11 zones based on geographical and cultural boundaries. The West Kapālama Geographic Zone is located within the western portion of Kapālama Ahupua'a, Honolulu District, Island of O'ahu, in a physiographic division known as the Pearl Harbor Plain (Armstrong 1983:36). The West Kapālama Zone extends approximately 410 m along Dillingham Boulevard and is bounded to the west by Kalihi Street and to the east by Waiakamilo Road. As part of the City Center AIS, a total of six test excavations (T-048 through T-053) were excavated in the West Kapālama Zone along and adjacent to Dillingham Boulevard (see Vol. IVB Section 1). Test excavation numbering runs from northwest to southeast. Test excavations documented within the West Kapālama Zone fall under the jurisdiction of the City and County of Honolulu (T-050 to T-053) and the Bishop Estate (T-048 through T-049). T-048 is located within TMK 1-5-028:066, T-049 is within TMK 1-5-028:022, T-050 is within TMK 1-5-029:049, T-051 is within TMK Plat 1-5-029, T-052 is within TMK Plat 1-5-027, and T-053 is within TMK 1-5-029:065.

8.2 Geography, Geology, and Land Forms

The West Kapālama Zone is situated along the low-lying coastal flats immediately inland of Kapālama Basin, approximately 1 km from the shoreline. Elevations within the West Kapālama Zone range from approximately 4.75 to 5.50 m above mean sea level, and the average annual rainfall measures 760 to 810 mm (30 to 32 inches) (Giambelluca et al. 2011). The West Kapālama Zone consists of a portion of the emerged reef in southern O'ahu that formed during the 7.5 m (Waimanalo) stand (Macdonald et al. 1983:420-421). In general, the West Kapālama Geographic Zone is located between 0.5 and 1.0 km inland from the modern shoreline. At the end of the nineteenth century, the shore of Ke'ehi Lagoon was between 300 and 800 m away from the West Kapālama Zone. Vegetation in the study area and immediate vicinity is primarily the result of landscaping including indigenous and introduced, non-indigenous landscaping trees, shrubs, and ground cover. These include but are not limited to: *kukui* (*Aleurites moluccana*), mango (*Mangifera*), *koa haole* (*Cordia sebestena*), banana (*Musa*), plumeria (*Plumeria obtusa*), monkeypod (*Albizia saman*), Hibiscus, and Bougainvillea.

According to the U.S. Department of Agriculture Soil Survey Geographic (SSURGO) Database (2001) and soils survey data gathered by Foote et al. (1972), soils within the West Kapālama Zone consist exclusively of Ewa silty clay loam (EmA) (Figure 119). Ewa silty clay loam soils are described as: ...well-drained soils in basins and on alluvial fans... [that] developed in alluvium derived from basic igneous rock... These soils are used for sugarcane, truck crops, and pasture. The natural vegetation consists of fingergrass, kiawe, koa haole, klu, and uhaloa [Foote et al. 1972:29].

8.3 Modern Land Use and Built Environment

The West Kapālama Zone traverses an urban environment through the neighborhoods of Kapālama. The centerline of the project alignment within the West Kapālama Zone lies within Dillingham Boulevard. Parcels bordering Dillingham Boulevard contain largely commercial structures, with some industrial warehouses, and parking lots, with several roads, alleyways, and driveways extending out from Dillingham Boulevard. Kalihi Kai Elementary School is located just *mauka* of T-048 and T-049. Dillingham Boulevard itself has been lined with cut basalt curbstones. A massive utility corridor is also present throughout the West Kapālama Zone containing electrical, gas, water, sewer, and storm lines. The number and distribution of these existing utilities indicates that this West Kapālama portion of Dillingham has been heavily disturbed in the past.

8.4 GPR Sediment Summary

Test excavations in the West Kapalama Geographic Zone (Zone 3) revealed that the area was predominantly fill material truncating naturally deposited Ewa silty clay loam (EmA) as predicted by the U.S.G.S Soil survey map of the zone (Figure 119). The transition from fill material to the naturally deposited silty clay was generally within the range of the GPR and could be clearly observed in the processed GPR profiles. The coral shelf was also observed in T-049 and T-052 within the range of clean signal return. The average depth of clean signal return for this area was approximately 0.75 mbs. Test Excavations that contained naturally deposited sediments within the GPR clean signal range are included in Table 4. Naturally deposited sediments within the range of clean GPR signal return for Zone 3. Representative signal texture profiles for Zone 3 are shown in Figure 120. Signal texture profiles were only collected if the signal return was clear and the stratum was at least 0.25 m thick.

Table 4. Naturally deposited sediments within the range of clean GPR signal return for Zone 3

ZONE 3-WEST KAPALAMA (T-48 TO T-53)			
TEST EXCAVATION	STRATUM	MATERIAL	STRATUM ORIGIN (mbs)
48	II	Silty clay loam	0.4
49	II	silty clay loam	0.25
49	III	coral shelf	0.6
52	II	silty clay loam	0.25
52	III	coral shelf	0.3
53	II	Gravelly silty loam	0.35

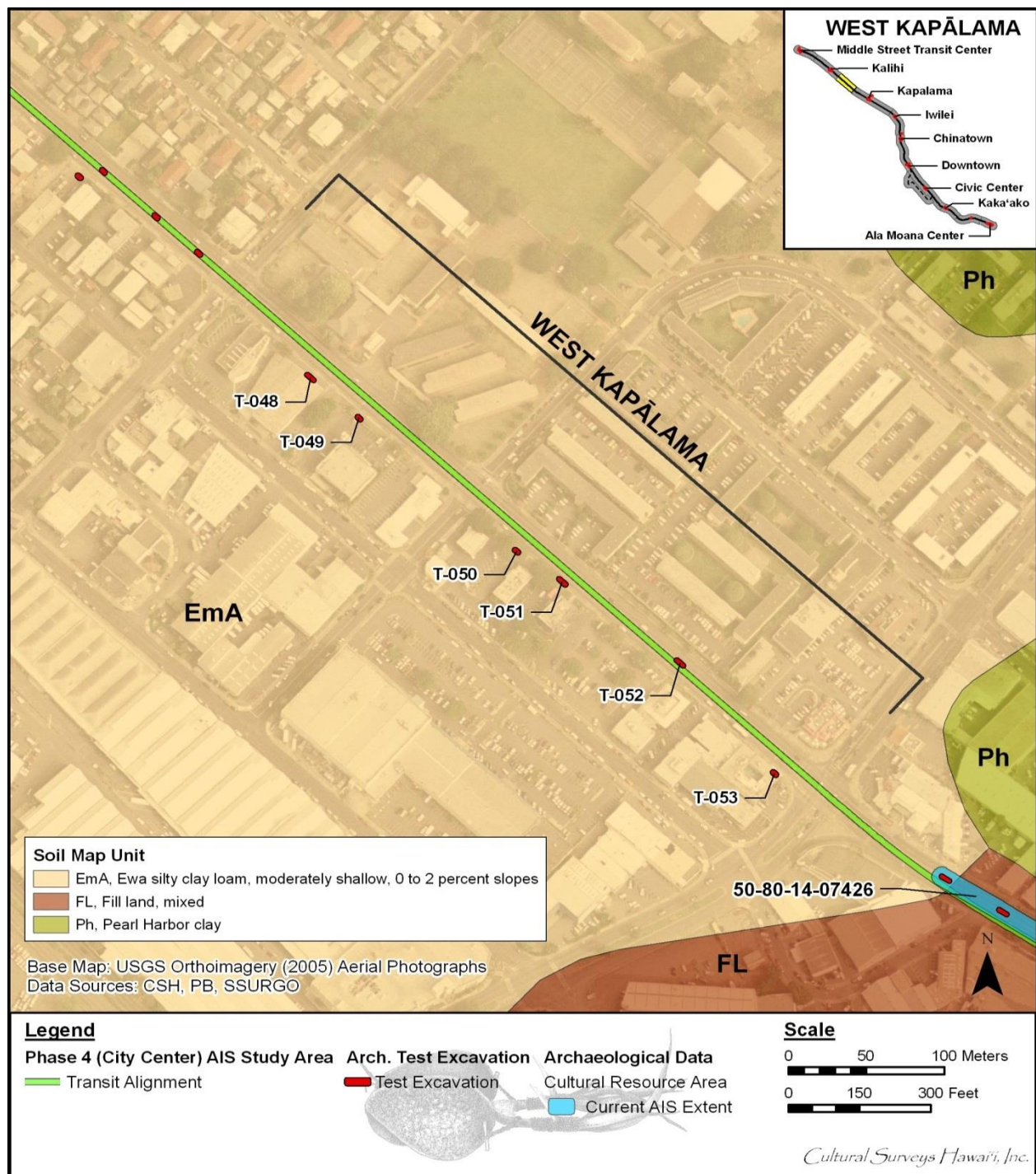
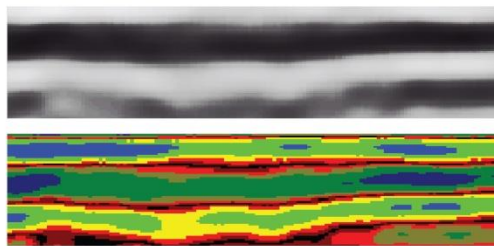
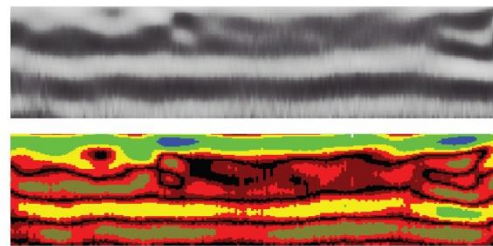


Figure 119. Aerial photograph (source: U.S. Geological Survey Orthoimagery 2005) with overlay of the Soil Survey of Hawai'i (Foote et al. 1972) showing sediment types within and in the vicinity of the West Kapālama Zone

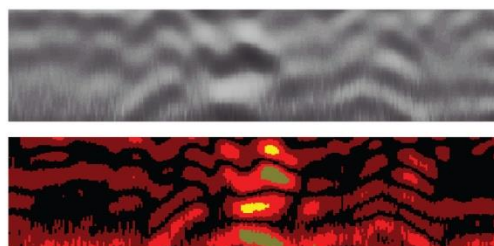
Examples of GPR Signal Textures Representing Zone 3 Sediments



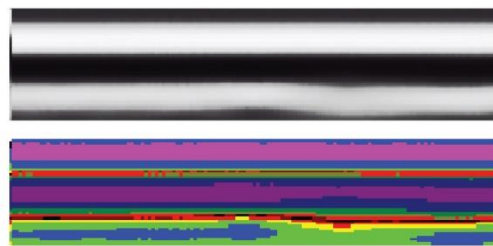
Extremely Gravelly Sand (T-048)



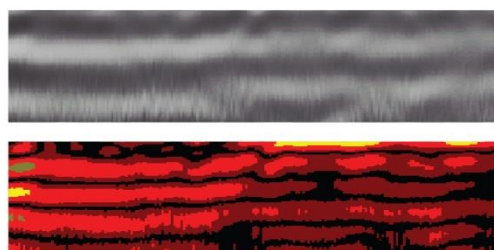
Silty Loam (T-050)



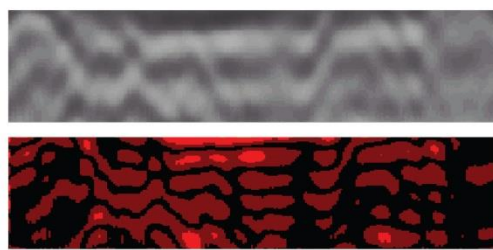
Coral Shelf (T-048)
Naturally Deposited



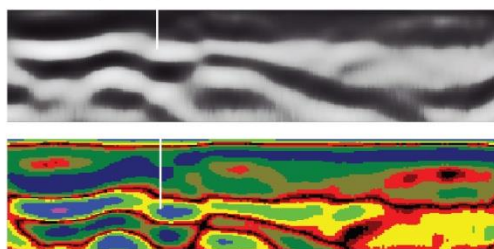
Asphalt (T-051)



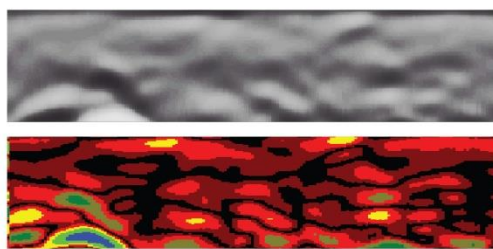
Silty Clay Loam (T-048)
Naturally Deposited



Crushed Coral (Extremely Gravelly Sand)
(T-052)



Gravelly Silty Loam (T-050)



Gravelly Silty Loam (T-053)
Naturally Deposited

Figure 120. Examples of GPR signal textures representing Zone 3 sediments

Test Excavation 48

T-048 measured 0.7 m by 7.4 m and was oriented northwest to southeast and was located within Eki Cyclery parking lot, 75.0 m southeast of Dillingham Boulevard and Kalihi Street intersection. The GPR grid measured 3.0 m by 10.0 m with 0.25 m spacing between Y transects and 1.0 m spacing between X transects. Utilities located near the excavation include a sewer line 3 m northeast.

A review of amplitude slice maps indicated a linear feature but was not within the excavation boundaries. Reflectivity was relatively uniform throughout the grid and decreased with depth except for the utility. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.5 mbs (Figure 121).

GPR depth profiles for T-048 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 122). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.25 mbs and again around 0.8 mbs. No utilities were observed in the profile. The maximum depth of clean signal return was approximately 1.25 mbs.

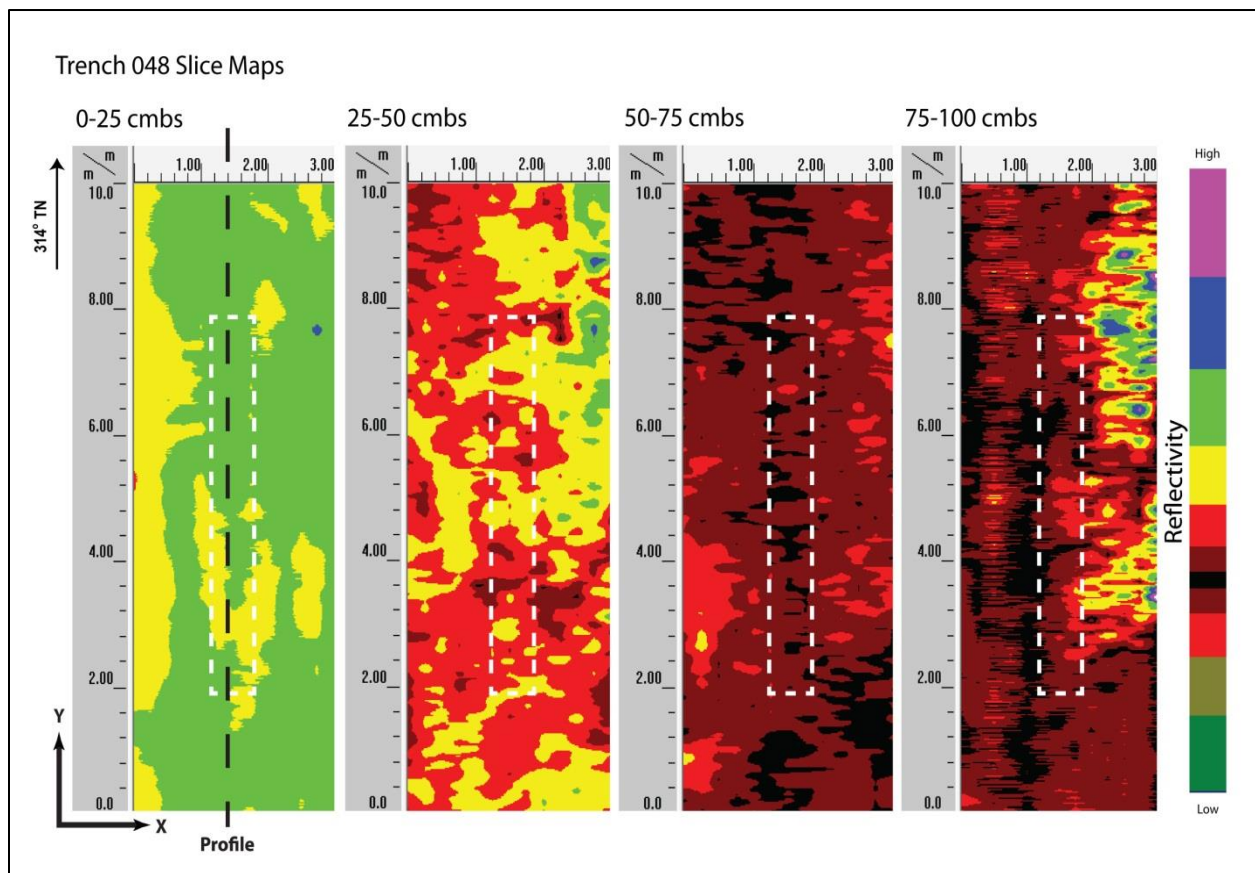


Figure 121. Slice maps of T-048 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a strong correlation in stratigraphic transitions (Figure 122). Strata Ia through II were clearly observed and occurred at the ground-truthed depths. Textural changes in the form of multiple small hyperbolas were apparent in Stratum II which was silty clay loam. No discrete objects or other stratigraphic transitions were observed in the GPR results or subsequent excavation.

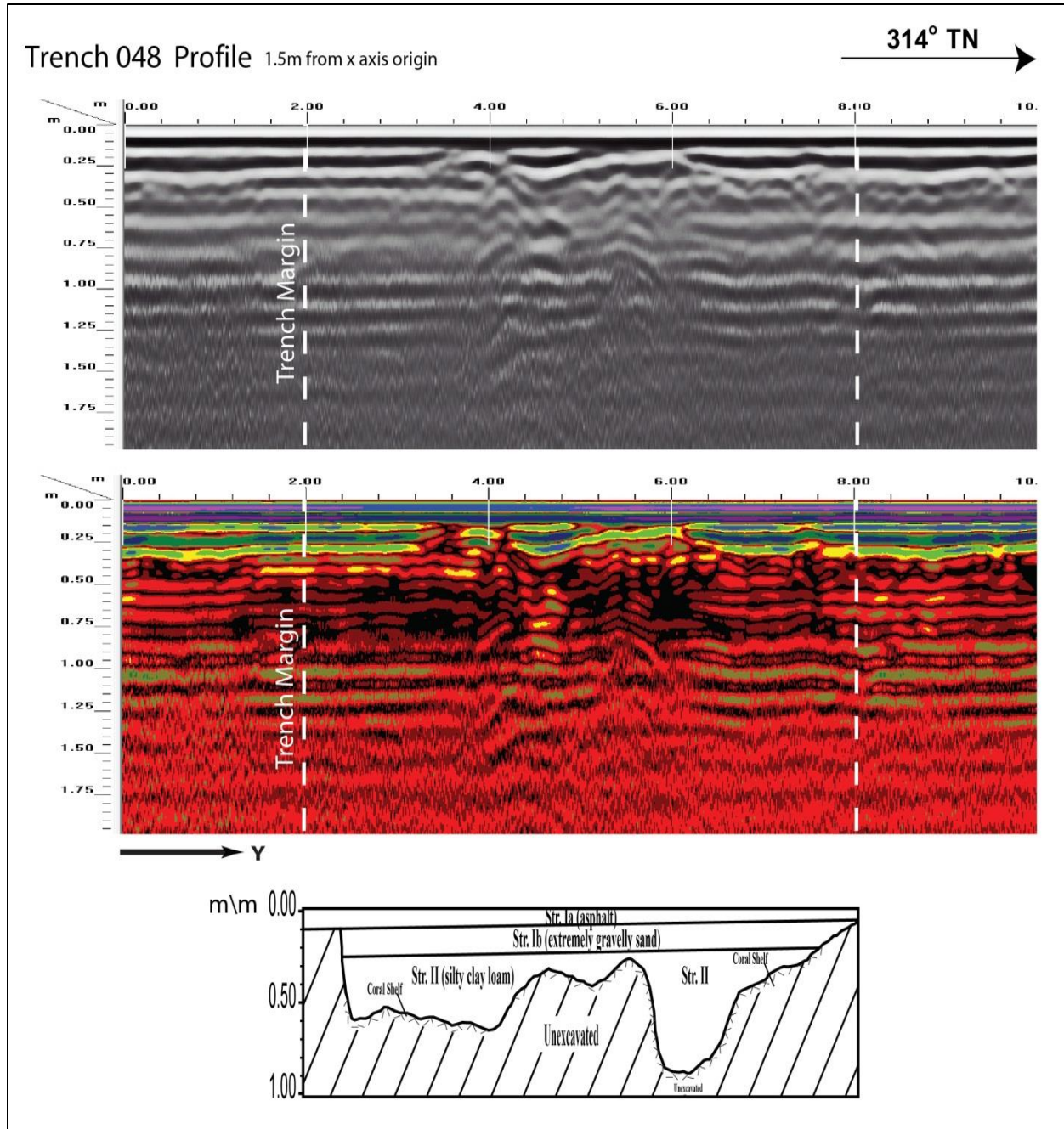


Figure 122. Visual comparison of excavated profile and GPR signal profile of T-048

Test Excavation 49

T-049 measured .9 m by 3.0 m and was oriented northwest to southeast and was located within a grassy median fronting O'Reilly Auto Parts, 87.0 m northwest of Dillingham Boulevard and McNeil Street intersection. The GPR grid measured 3.0 m by 7.0 m with 0.25 m spacing between Y transects and 1.0 m spacing between X transects. Utilities located near the excavation include: sewer 2.3 m northeast and an electrical 4.0 m northeast. A. abandoned metal pipe was encountered 0.25 mbs in the center of the excavation.

A review of amplitude slice maps indicated no linear features which might have indicated the presence of utilities although a metal pipe was encountered during excavation. Reflectivity was relatively uniform throughout the grid and decreased with depth. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.25 mbs (Figure 123).

GPR depth profiles for T-049 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 124). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.2 mbs. No utilities were observed in the profile but a metal pipe was encountered during excavation. The maximum depth of clean signal return was approximately 0.85 mbs.

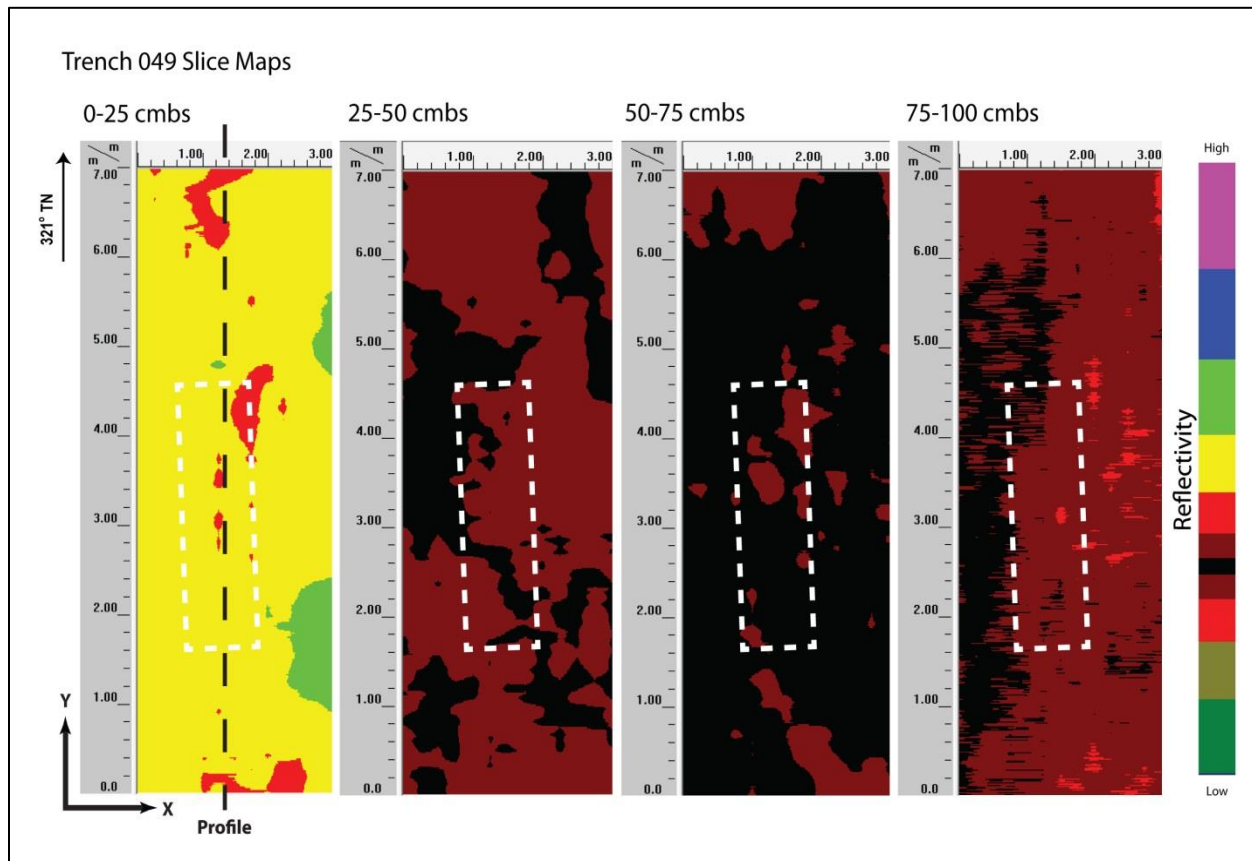


Figure 123. Slice maps of T-049 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a moderate correlation in stratigraphic transitions (Figure 124). Strata Ia and II were all clearly observed and occurred at the ground-truthed depths. Stratum Ib was not discernible from Stratum Ia possibly due the fact that Ib was a very thin layer. A metal pipe was found 0.25 mbs. The pipe did not show up on the profile or slice maps. This may be due to the fact that the pipe was empty or very small. No other discrete objects or other stratigraphic transitions were observed in the GPR results or subsequent excavation.

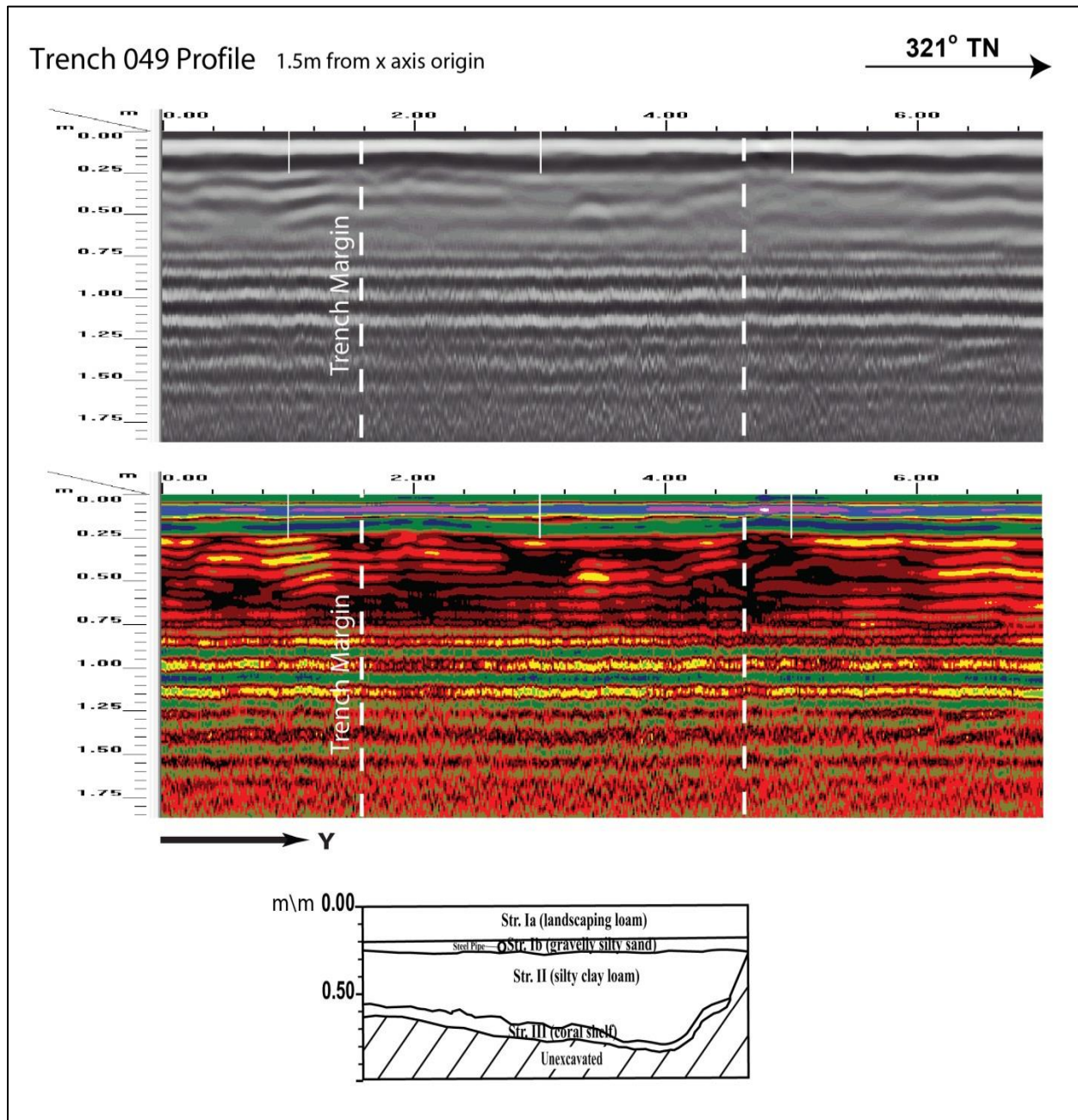


Figure 124. Visual comparison of excavated profile and GPR signal profile of T-049

Test Excavation 50

T-050 measured 0.9 m by 3.0 m and was oriented northwest to southeast and was located within a grassy area fronting Popeye's, 40.0 m southeast of Dillingham Boulevard and McNeil Street intersection. The GPR grid measured 3.0 m by 8.0 m with 0.25 m spacing between Y transects and 1.0 m spacing between X transects. Utilities located near the excavation include: sewer line 1.1 m northeast and water drainage line 2.8 m northeast. No utilities transected the GPR grid or excavation location. A PVC utility was encountered 0.07 mbs on the northwestern end of the excavation.

A review of amplitude slice maps indicated no linear features although a utility was encountered during excavation. Reflectivity was relatively uniform throughout the grid and decreased with depth. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.5 mbs (Figure 125).

GPR depth profiles for T-050 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 126). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.25 mbs. No utilities were observed in the profile although a utility was encountered during excavation. The maximum depth of clean signal return was approximately 0.65 mbs.

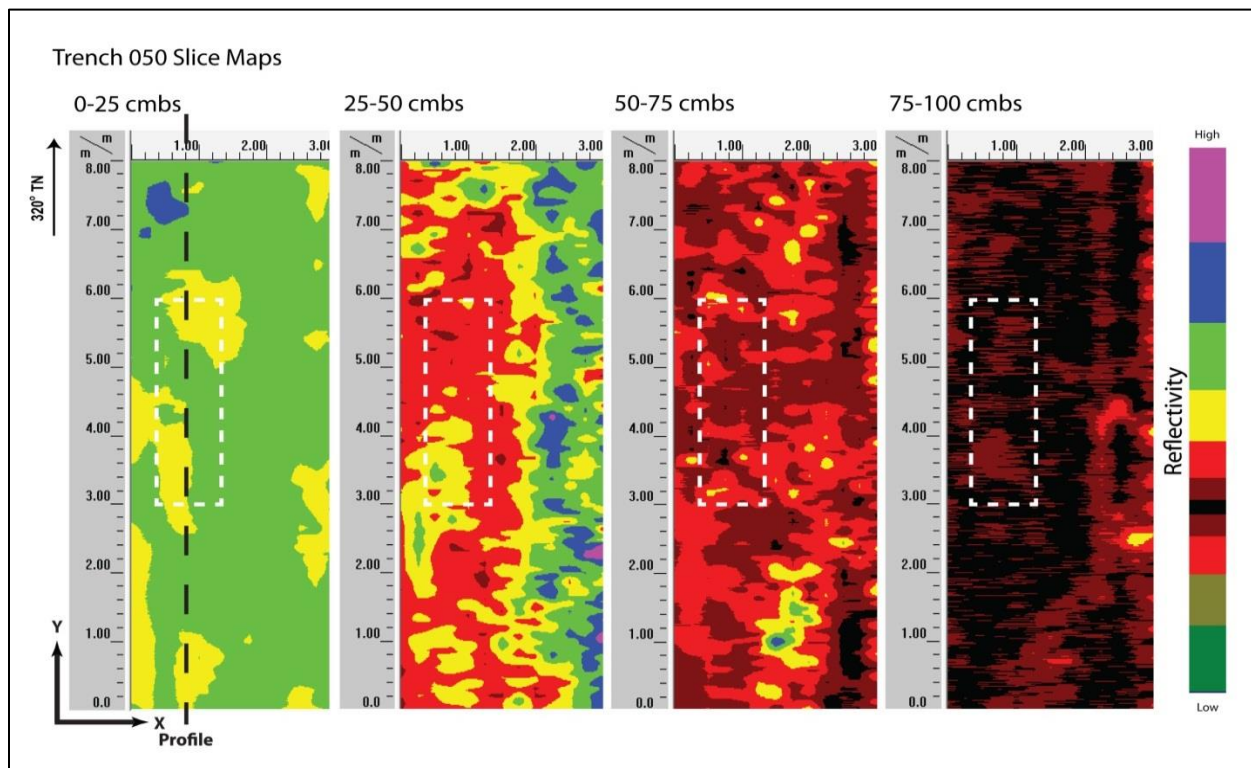


Figure 125. Slice maps of T-050 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a strong correlation in stratigraphic transitions (Figure 126). Strata I and II were clearly observed and occurred at the ground-truthed depths. A PVC utility pipe was found 0.07 mbs. This pipe did not show up on the slices or profile. This may be due to the fact that the pipe was comprised of PVC, the pipe was empty, or that it was very small. No discrete objects or other stratigraphic transitions were observed in the GPR results or subsequent excavation.

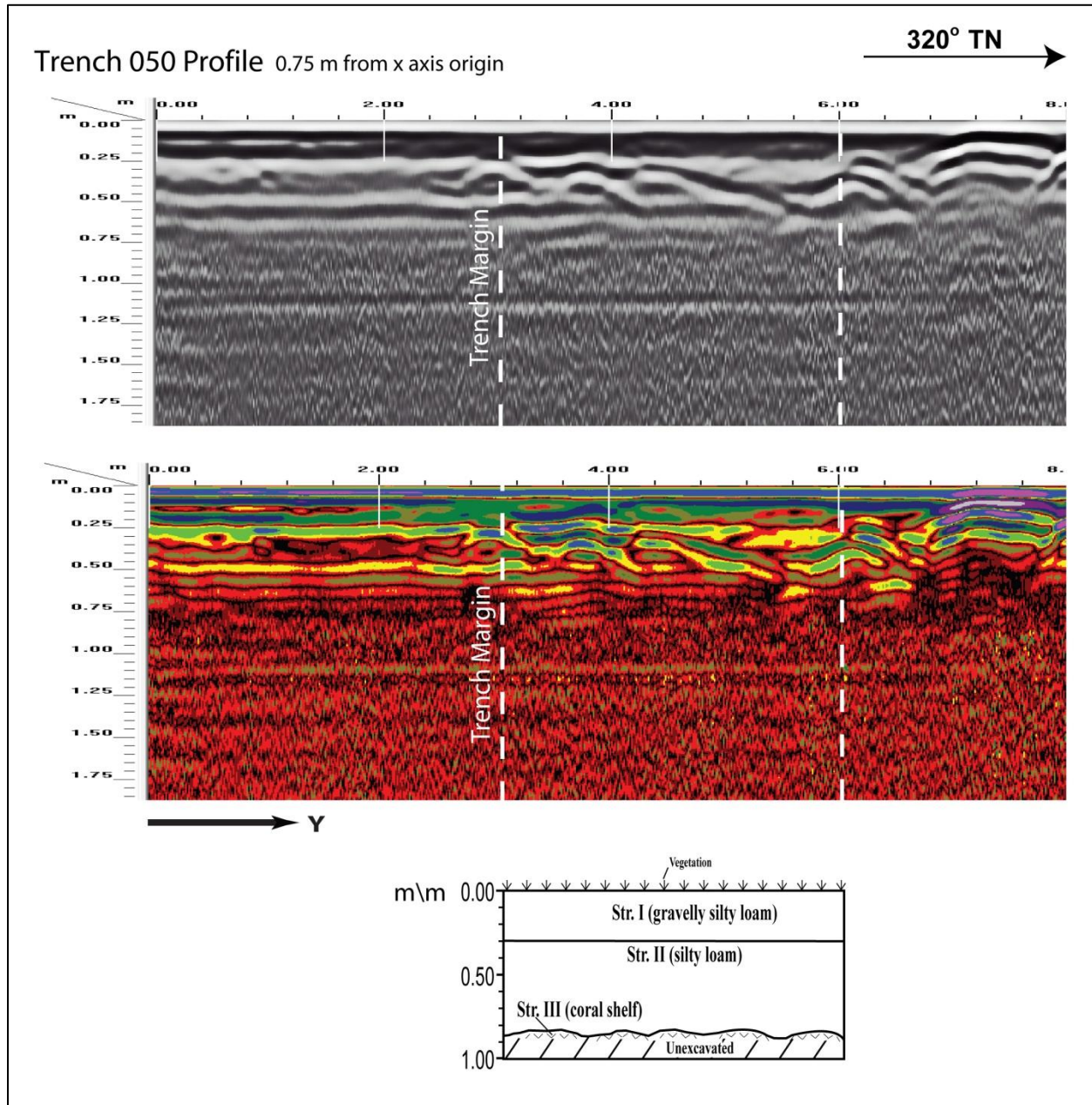


Figure 126. Visual comparison of excavated profile and GPR signal profile of T-050

Test Excavation 51

T-051 measured 0.6 m by 6.0 m and was oriented northwest to southeast and was located within the road cut of Dillingham Boulevard in the eastbound lane, 78.0 m southeast of Dillingham Boulevard and McNeill Street intersection. The GPR grid measured 2.5 m by 6.0 m with 0.25 m spacing between Y transects and 1.0 m spacing between X transects. Utilities located near the excavation include: drain pipe along the southwest excavation wall and a water line 3.7 m northeast. A concrete jacket was encountered 0.89 mbs and extended across the entire excavation.

A review of amplitude slice maps indicated a linear feature which corresponded to the concrete jacket that was encountered during excavation. Reflectivity was relatively uniform throughout the grid and decreased with depth except for the concrete jacket. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.5 mbs (Figure 127).

GPR depth profiles for T-051 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 128). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.25 mbs. No utilities were observed in the profile although a concrete jacket was encountered during excavation. The maximum depth of clean signal return was approximately 0.8 mbs.

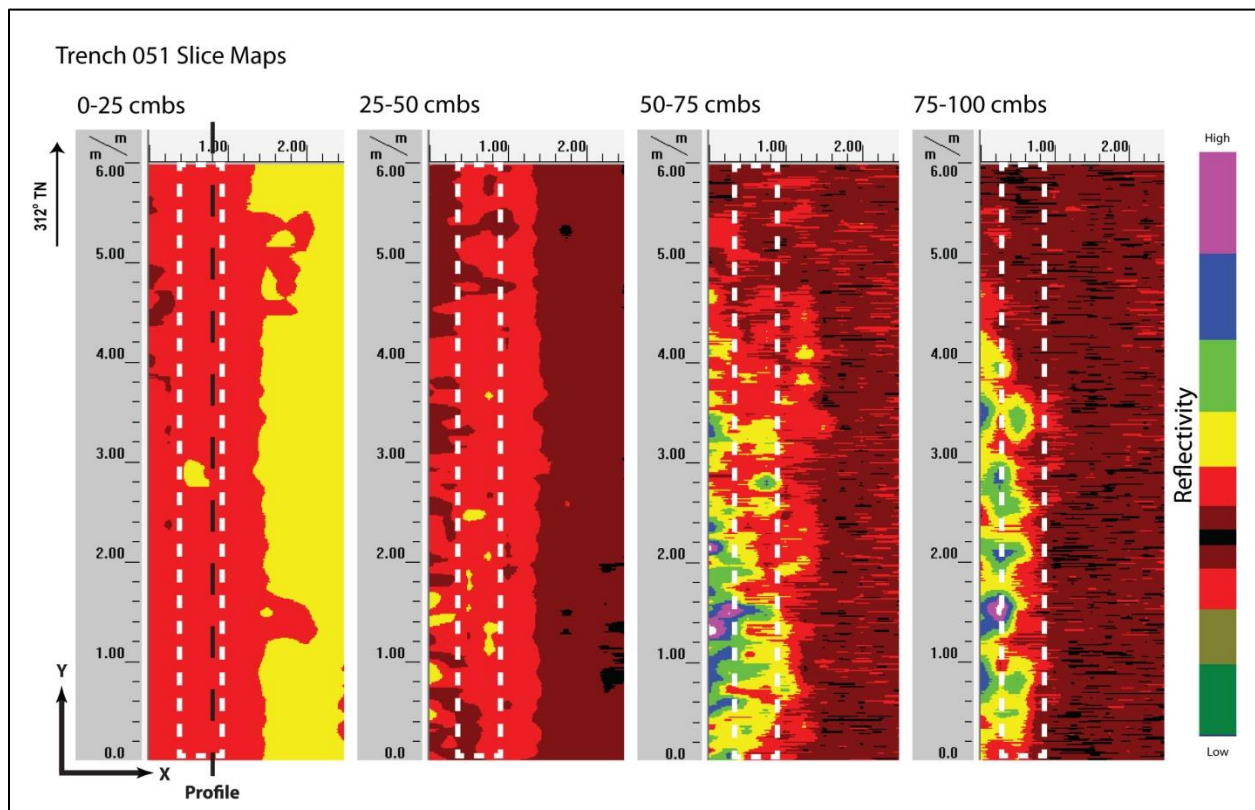


Figure 127. Slice maps of T-051 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a strong correlation in stratigraphic transitions (Figure 128). Strata Ia through Ic were clearly observed and occurred at the ground-truthed depths. Textural changes in the form of multiple small hyperbolas were apparent in Stratum Ic which was a very gravelly sandy loam fill. A concrete jacket was found 0.89 mbs but this was below the maximum clean signal return depth and therefore was not able to be observed in the GPR profile. No other discrete objects or other stratigraphic transitions were observed in the GPR results or subsequent excavation.

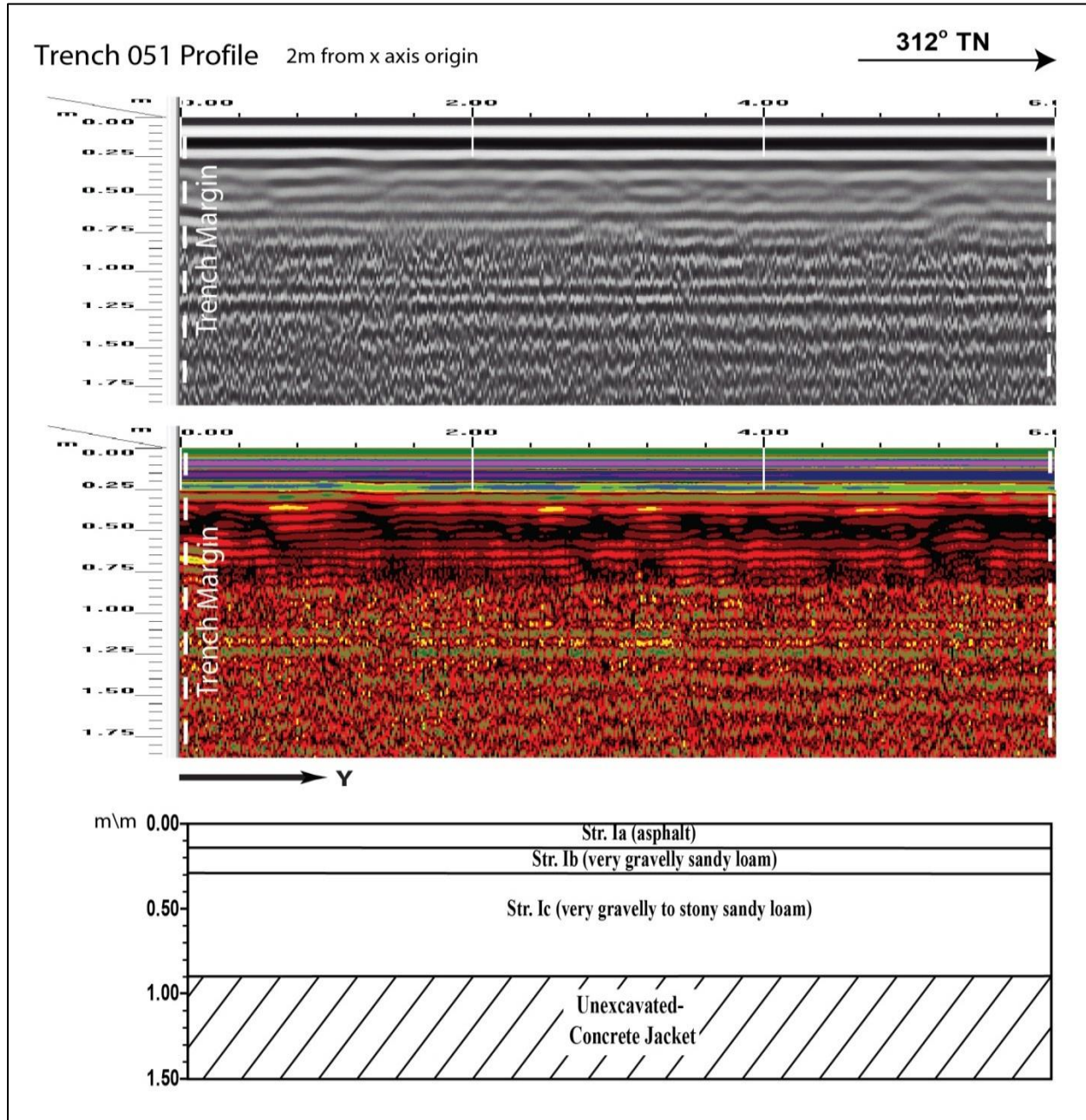


Figure 128. Visual comparison of excavated profile and GPR signal profile of T-051

Test Excavation 52

T-052 measured 0.6 m by 6.0 m and was oriented northwest to southeast and was located within the road cut of Dillingham Boulevard in the westbound lane across from Dillingham Plaza and fronting Sizzlers. The GPR grid measured 2.0 m by 10.0 m with 0.25 m spacing between Y transects and 1.0 m spacing between X transects. Utilities located near the excavation include: water line 1.5 m northeast, electrical line 1.9 m southwest, and a sewer line 2.3 m southwest. No utilities transected the GPR grid or excavation location.

A review of amplitude slice maps indicated a linear feature but not within the excavation boundaries. Reflectivity was relatively uniform throughout the grid and decreased with depth except for the observed linear feature. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.5 mbs (Figure 129).

GPR depth profiles for T-052 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 130). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.25 mbs and again around 0.75 mbs. No utilities were observed in the profile. The maximum depth of clean signal return was approximately 1.25 mbs.

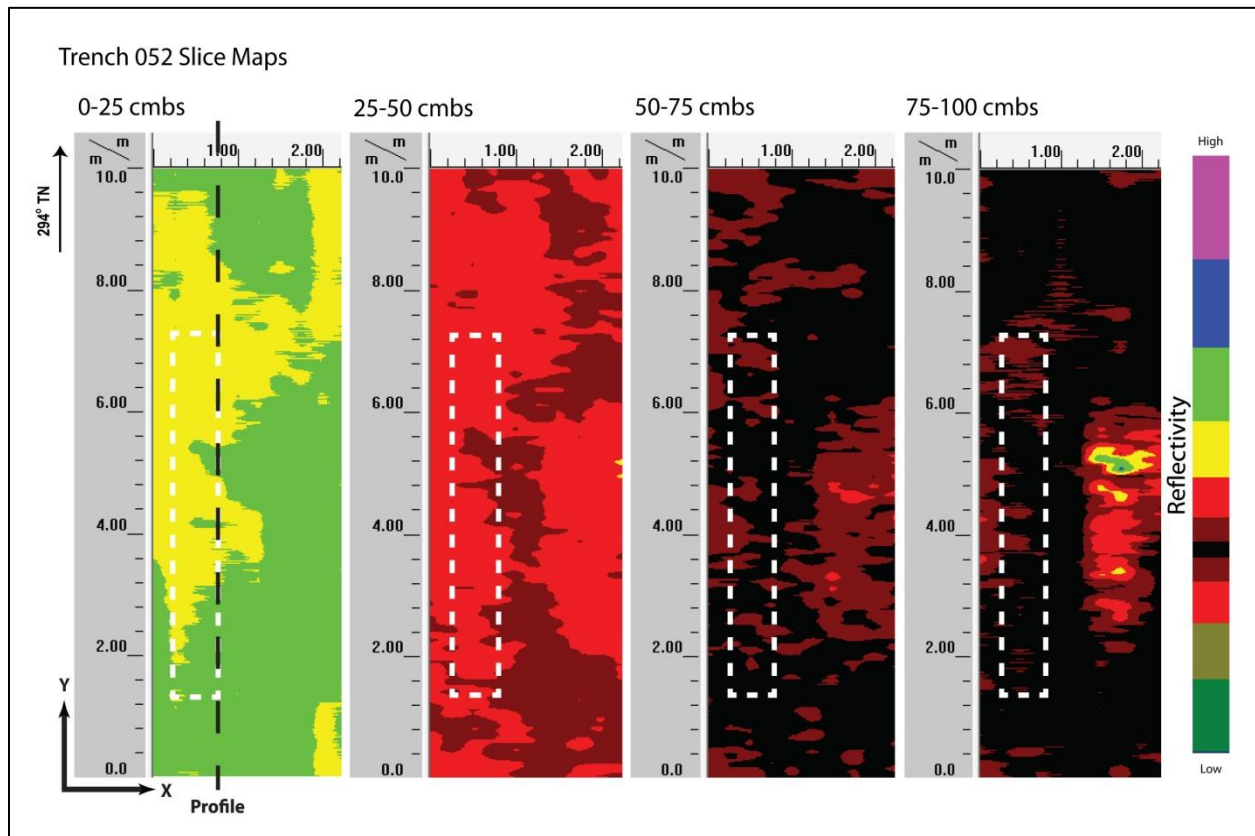


Figure 129. Slice maps of T-052 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a moderate correlation in stratigraphic transitions (Figure 130). Strata Ia to Ib were all clearly observed and occurred at the ground-truthed depths. Several voids were observed on the GPR profile and correspond to the undulating coral shelf. Strata Ic and II were not clearly depicted in the GPR profile. No discrete objects or other stratigraphic transitions were observed in the GPR results or subsequent excavation.

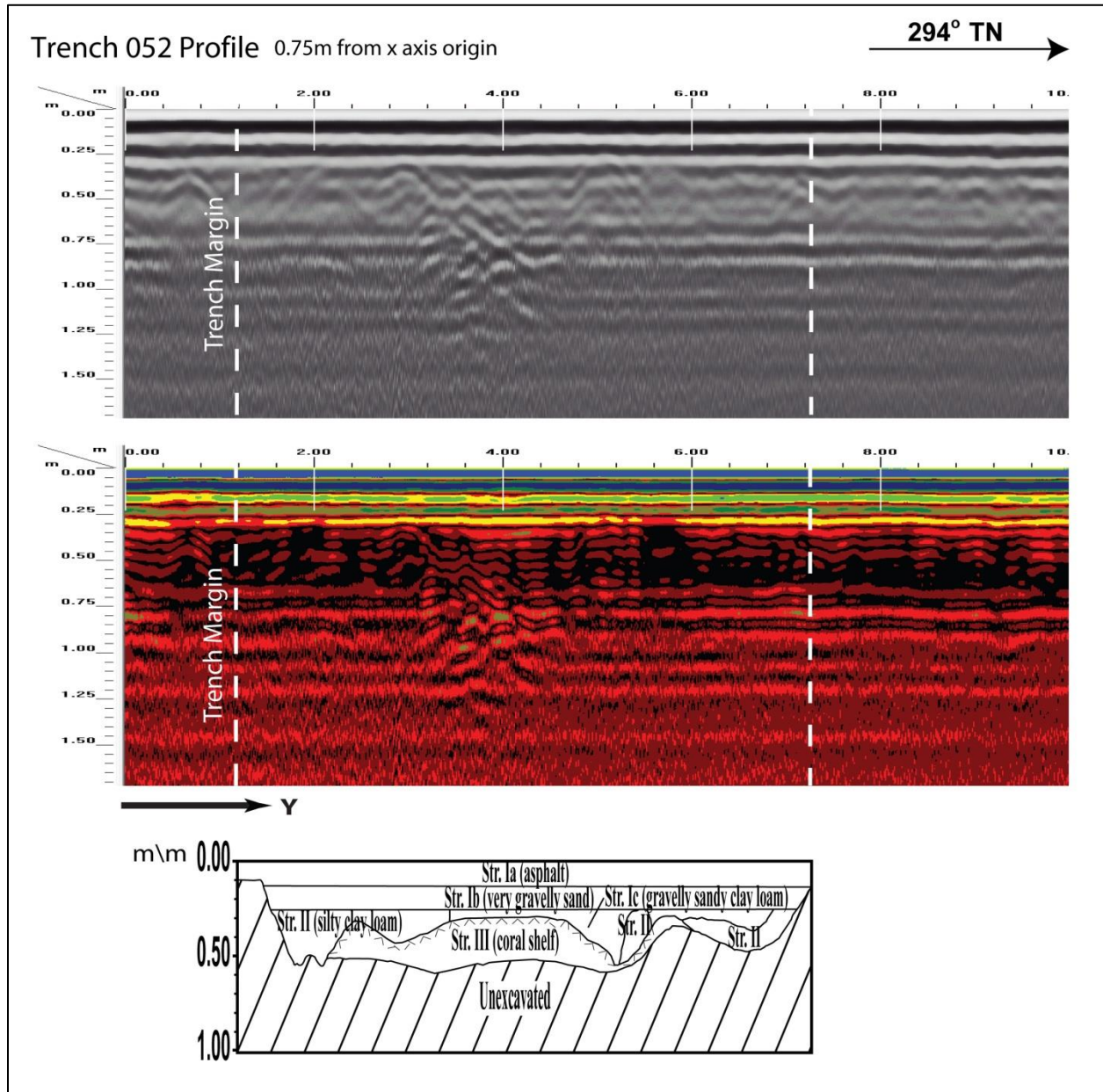


Figure 130. Visual comparison of excavated profile and GPR signal profile of T-052

Test Excavation 53

T-053 measured 0.9 m by 3.0 m and was oriented northwest to southeast and was located within a grassy median fronting the Midas, 30.0 m west of Dillingham Boulevard and Waiakamilo Road intersection. The GPR grid measured 3.0 m by 7.0 m with 0.25 m spacing between y transects and 1.0 m spacing between X transects. Utilities located near the excavation include a sewer line 1.2 m northeast. No utilities transected the GPR grid or excavation location.

A review of amplitude slice maps indicated a linear feature but not within the excavation boundaries. Reflectivity was relatively uniform throughout the grid and decreased with depth except for the observed feature. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.5 mbs (Figure 131).

GPR depth profiles for T-053 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 132). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.25 mbs and again around 0.75 mbs. An anomaly was observed in the profile but not within the excavation boundaries. The maximum depth of clean signal return was approximately 1.15 mbs.

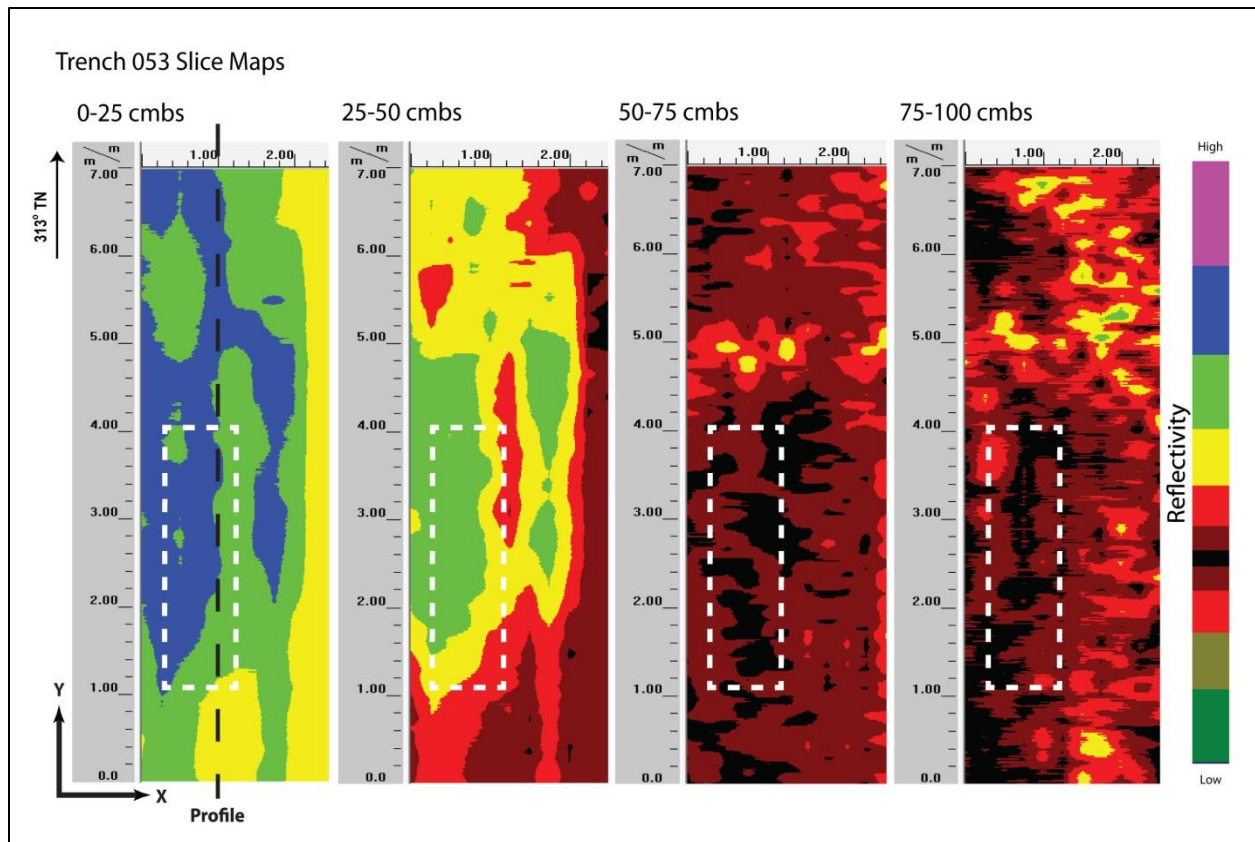


Figure 131. Slice maps of T-053 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a moderate correlation in stratigraphic transitions (Figure 132). Strata included a layer of very gravelly to cobbly loam fill on top a very gravelly silty loam fill followed by a very gravelly to cobbly sand fill and ending with a natural gravelly silty loam. Strata Ia through Ic were not individually discernible, possibly due to the fact that they were very thin layers of the compacted fill, but based on reflectivity and horizontal banding it was apparent that there were multiple layers of fill events. Stratum II and the coral shelf were clearly observed and occur at the ground-truthed depths. No discrete objects or other stratigraphic transitions were observed in the GPR results or subsequent excavation.

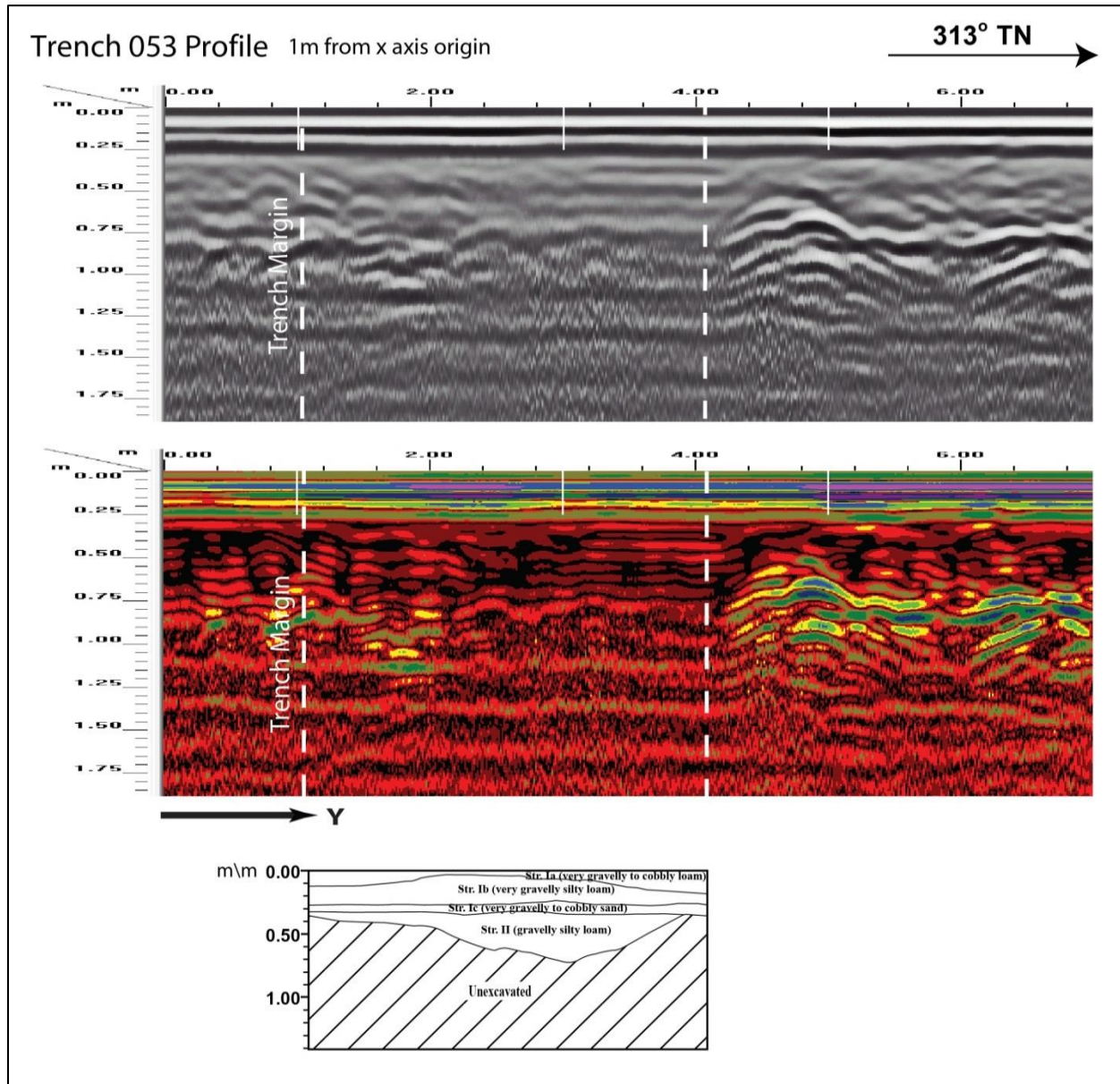


Figure 132. Visual comparison of excavated profile and GPR signal profile of T-053